What is claimed is:

1. A power coupling device for coupling power to a rotating member, said power coupling device comprising:

a. a primary magnetic core defining a first recess;

b. a secondary magnetic core defining a second recess and disposed adjacent said primary magnetic core;

wherein said primary and secondary cores are arranged so as to form an air gap therebetween, said air gap permitting relative rotation of said cores about a common axis of rotation; and

c. a primary conductive winding disposed within said first recess and a secondary conductive winding disposed within said second recess;

wherein at least one of said primary and said secondary windings comprises a fractional turn winding.

2. A power coupling device in accordance with claim 1, wherein said fractional turn winding is equal to a single turn winding multiplied by a factor N1 / N2, where N1 and N2 are nonzero integers.

3. A power coupling device in accordance with claim 1, wherein said power coupling device is adapted for coupling power to said rotating member at a plurality of voltage levels, said voltage levels having a magnitude equal to N1 / N2 times a single turn voltage, where N1 and N2 are nonzero integers.

4. A power coupling device in accordance with claim 1, wherein said first and second recesses are substantially annular.

5. A power coupling device in accordance with claim 1, wherein said primary core and said secondary core are situated concentrically with respect to each other about said common axis of rotation, and wherein said air gap extends radially between said primary core and said secondary core.

6. A power coupling device in accordance with claim 5, wherein said air gap has a substantially cylindrical configuration, and is situated concentrically with respect to said common axis of rotation.

7. A power coupling device in accordance with claim 1, wherein said primary core and said secondary core have substantially the same dimensions, and wherein said primary core and said secondary core are situated side by side with said air gap extending axially therebetween.

8. A power coupling device in accordance with claim 1, wherein at least one of said primary and secondary cores have a substantially semi-toroidal configuration.

9. A power coupling device in accordance with claim 1, wherein at least one of said primary core and said secondary core comprises a plurality of individual ferrite core elements disposed adjacent to each other.

10. A power coupling device according to claim 9, wherein said plurality of ferrite core elements are arranged in a substantially annular configuration.

11. A power coupling device in accordance with claim 10, wherein each of said plurality of individual ferrite core elements have a substantially U-shaped configuration.

12. A power coupling device in accordance with claim 3, wherein said fractional turn winding comprises metallic foil.

13. A power coupling device in accordance with claim 3, wherein N1 is less than N2 and each of said plurality of voltage levels has a magnitude less than a single turn voltage.

14. A power coupling device in accordance with claim 1, wherein said primary and secondary cores have one of a substantially U-shaped cross-section, and a substantially C-shaped cross-section.

15. A power coupling device in accordance with claim 1, further comprising a first conductive shield surrounding said primary core and a second conductive shield surrounding said secondary core, said conductive shields being adapted to cancel out the oscillating magnetic fields that are formed contiguous to the outer surface of said cores when a current is passed through one or more of said windings.

16. A power coupling device in accordance with claim 15, wherein said first and second conductive shields are annular metallic shells having a substantially semi-toroidal configuration.

17. A power coupling device in accordance with claim 16, wherein said annular shells are substantially continuous.

18. A power coupling device in accordance with claim 17, wherein said first and second conductive shields are configured to support a current that is substantially equal in magnitude and opposite in direction to the net current in said conductive windings.

19. A power coupling device in accordance with claim 1, further comprising a support structure for supporting said cores and said windings.

20. A power coupling device in accordance with claim 19,
wherein said support structure comprises conductive shields surrounding said primary core and said secondary core for cancelling out oscillating magnetic

fields that are formed contiguous to the outer surface of said cores when a current is passed through one or more of said windings; and
wherein said conductive shields are annular metallic shells having a substantially semi-toroidal configuration.

21. A power coupling device in accordance with claim 1, wherein said primary and secondary cores are made of a magnetically permeable material, including but not limited to ferrite, silicon iron, nickel ion alloy, stainless steel, and cobalt iron alloy.

22. A power coupling device in accordance with claim 1, wherein said second recess is disposed opposite said first recess and spaced apart therefrom.

23. A system including a power coupling device adapted to transmit power at a plurality of voltage levels, said system comprising:

a. a static member;

b. a rotatable member coupled to said static member;

c. a power source; and

d. an inductive power coupling device responsive to said power source for transmitting power from said power source to at least one of said static member and said rotatable member, said inductive power coupling device comprising

i. a primary magnetic core defining a first recess;

ii. a secondary magnetic core defining a second recess;

wherein said primary and secondary cores are disposed so as to form an air gap therebetween, said air gap permitting relative rotation of said cores about a common axis of rotation;

iii. a primary conductive winding disposed within said first recess and a secondary conductive winding disposed within said second recess;
wherein at least one of said primary and said secondary windings comprises a fractional turn winding.

24. A system in accordance with claim 23, wherein said system is a CT scanner, said stationary member comprises a static gantry in said CT scanner, and said rotatable member has an x-ray source mounted at a distal end thereof.

25. A system in accordance with claim 23,
wherein said power coupling device is adapted for transmitting power at a plurality of voltage levels; and
wherein said fractional turn winding is equal to a single turn winding multiplied by a factor N1 / N2, and said voltage levels having a magnitude equal to N1 / N2 times a single turn voltage, where N1 and N2 are nonzero integers.

26. A system in accordance with claim 25, wherein N1 is less than N2, said plurality of voltage levels each has a magnitude less than a single turn voltage, and said fractional turn winding provides a low power tap for supplying power at a reduced voltage.

27. A system in accordance with claim 26, wherein said fractional turn winding comprises metallic foil.

28. A system in accordance with claim 26, wherein said fractional turn winding provides a low power tap for supplying power at a reduced voltage to said static member.

29. A system in accordance with claim 26, wherein said fractional turn winding provides a lower power tap for supplying power at a reduced voltage to said rotatable member.